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Docket No.: 05516/089003
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Letters Patent of:
Carl M. Hoffmaster et al.

Patent No.: 7,451,837

Issued: November 18, 2008

For: ADVANCED EXPANDABLE REAMING TOOL

REQUEST FOR CERTIFICATE OF CORRECTION
PURSUANT TO 37 CFR 1.322

Attention: Certificate of Correction Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Madam:

Upon reviewing the above-identified patent, Patentee noted a typographical error which should be corrected.

In the Claims:

In Claim 6, column 10, line 50, "cuffing" should be --**cutting**--.

The error was not in the application as filed by applicants; accordingly no fee is required.

Transmitted herewith is a proposed Certificate of Correction effecting such amendment. Also enclosed, as evidence of the error, is a copy of the claims as issued, and a copy of the Claims as allowed. Patentee respectfully solicits the granting of the requested Certificate of Correction.

Applicants believe no fee is due with this request. However, if a fee is due, please charge our Deposit Account No. 50-0591, under Order No. 05516/089003.

Dated: January 13, 2009

Respectfully submitted,

By _____

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AMENDMENTS TO THE CLAIMS

1-200. Canceled

201. (Currently Amended) An expandable reaming tool, comprising:

at least two reamer pads operatively coupled to a tool body and configured to be displaced between a retracted position and an expanded position;

at least one spiral blade formed on at least one of the at least two reamer pads;

a plurality of cutting elements disposed on the at least one spiral blade,

wherein the plurality of cutting elements are arranged so as to substantially balance at least one parameter selected from axial force, lateral force, work, and mass between the at least two reamer pads,

wherein the expandable reaming tool is configured to ream while drilling.

202. (Previously Presented) The expandable reaming tool of claim 201, wherein the plurality of cutting elements comprise at least one of polycrystalline diamond inserts, tungsten carbide inserts, and boron nitride inserts.

203. (Currently Amended) The expandable reaming tool of claim 201, further comprising at least one gage protection element disposed on a gage surface of the at least one spiral blade.

204. (Previously Presented) The expandable reaming tool of claim 203, wherein the at least one gage protection element comprises at least one of a thermally stabilized polycrystalline insert and a polycrystalline diamond insert.

205. (Currently Amended) The expandable reaming tool of claim 201, further comprising a vibration damping insert disposed on the at least one spiral blade.

206. (Previously Presented) The expandable reaming tool of claim 201, wherein the at least two reamer pads and the plurality of cutting elements are arranged to backream a formation in a wellbore.

207. (Previously Presented) The expandable reaming tool of claim 201, wherein the plurality of cutting elements are arranged to form a tapered cutting structure.

208. (Previously Presented) The expandable reaming tool of claim 201, wherein the plurality of cutting elements have backrake angles of greater than 20 degrees.

209. (Previously Presented) The expandable reaming tool of claim 201, wherein selected ones of the plurality of cutting elements have different backrake angles than other ones of the plurality of cutting elements.

210. (Previously Presented) The expandable reaming tool of claim 201, wherein each of the plurality of cutting elements has a diameter of less than 13.0 mm or greater than 13.0 mm.

211. (Previously Presented) The expandable reaming tool of claim 201, wherein selected ones of the plurality of cutting elements disposed on one of the at least two reamer pads are positioned so as to form a redundant cutting arrangement with other selected ones of the plurality of cutting elements disposed on a different one of the at least two reamer pads.

212. (Previously Presented) The expandable reaming tool of claim 201, wherein the at least two reamer pads and the plurality of cutting elements are configured to substantially mass balance the expandable reaming tool about an axis of rotation of the reaming tool.

213. (Currently Amended) The expandable reaming tool of claim 201, wherein the at least two reamer pads and the at least one spiral blade are formed from a non-magnetic material.

214. (Currently Amended) The expandable reaming tool of claim 201, wherein the at least two reamer pads and the at least one spiral blade are formed from a matrix material infiltrated with a binder alloy.

215. (Currently Amended) The expandable reaming tool of claim 201, wherein surfaces of the at least one spiral blade proximate the plurality of cutting elements are shaped so that a cutting element exposure is equal to at least half of a diameter of the cutting element.

216. (Currently Amended) The expandable reaming tool of claim 201, wherein a perpendicular distance measured from a surface of the at least two reamer pads to an outermost extent of a gage cutting element disposed on the at least one spiral blade is equal to at least twice a diameter of the gage cutting element.

217. (Currently Amended) The expandable reaming tool of claim 201, wherein a gage surface of the at least one spiral blade comprises a hardfacing material.

218. (Currently Amended) The expandable reaming tool of claim 201, wherein a gage surface of the at least one spiral blade is formed from a diamond impregnated material.

each of the reamer pads can be adjusted to provide the reaming tool with a substantially balanced amount of work performed by each reamer pad.

Force balancing and work balancing may also refer to a substantial balancing of forces and work between cutting elements, between redundant cutting elements, etc. Balancing may also be performed over the entire reaming tool (e.g., over the entire cutting structure). In other embodiments, forces may be balanced so that there is a substantially zero net lateral force acting on the reaming tool (e.g., on the reamer pads) during drilling operations. Balancing to establish a substantially zero net lateral force helps ensure that the reaming tool maintains a desired trajectory without substantial lateral deviation when operating in a wellbore.

In other embodiments of the invention, reaming pads are adapted to substantially mass balance the reaming tool about an axis of rotation of the reaming tool. For example, substantially identical reamer pads may be arranged symmetrically about the axis of rotation. In other embodiments, asymmetric and/or non-identical blade arrangements and/or asymmetric reamer pad arrangements may be used to achieve mass balance about the axis of rotation. Mass balancing helps ensure that the reaming tool is dynamically stable and maintains a desired drilling and/or reaming trajectory.

Another embodiment of the invention shown in FIG. **6** is backreaming capable. A reaming tool **70** comprises a plurality of cutting elements **72** disposed on reamer pads **78** and arranged to underream the wellbore (**38** in FIG. **2**) in the manner described with respect to, for example, the embodiments described above. However, the reamer pads **78** also comprise additional backreaming cutting elements **74** that are arranged to underream the wellbore (**38** in FIG. **2**) when the BHA (that includes the underreamer **70**) is being pulled in an upward direction (e.g., when the reaming tool **70** is being pulled out of the wellbore (**38** in FIG. **2**)). For example, as the reaming tool **70** is run into the wellbore (**38** in FIG. **2**) while drilling, the plurality of cutting elements **72** are arranged to underream the wellbore (**38** in FIG. **2**) to a selected diameter. In this manner of operation, the backreaming cutting elements **74** do not typically contact the formation. However, when the BHA is then pulled out of the wellbore (e.g., toward the surface), the backreaming cutting elements **74** will effectively "drill out" any portion of the formation that has not previously been underreamed to the selected diameter.

Alternatively, the reaming tool **70** may be run into the wellbore (**38** in FIG. **2**) with the reamer pads **78** in the retracted position. Then, once the reaming tool **70** has been positioned at a selected depth, the reamer pads **78** may be expanded and the underreaming process may be completed as the reaming tool **70** is being pulled out of the wellbore (**38** in FIG. **2**). Therefore, the backreaming cutting elements **74** may serve a dual function because they both ensure that an underreamed portion of the wellbore (**38** in FIG. **2**) is reamed to the selected diameter and they enable the reaming tool **70** to operate while pulling out of the wellbore (**38** in FIG. **2**).

In other embodiments (as shown in FIG. **6**), the cutting elements **72**, **74** disposed on reamer pads **78** of a reaming tool **70** are arranged to form tapered cutting profiles **82**, **84**. In some embodiments, the cutting profiles **82**, **84** may be substantially conical or substantially hemispherical. However, other tapered shapes may be used in other embodiments of the invention. For example, some embodiments comprise tapers wherein diameters of the reaming tool **70** subtended by cutting elements **72**, **74** disposed on the reamer pads **78** are dependent upon an axial position of the cutting elements **72**, **74** with respect to an axis of the reaming tool **70**. Arrangement of the cutting elements **72**, **74** in tapered cutting profiles **82**, **84** enables the reaming tool **70** to gradually underream the formation (**38** in FIG. **2**) while drilling. Further, in some embodiments, the cutting elements **72** are disposed on the reamer pads **78** of the reaming tool **70** so as to form an angled cutting structure **84**.

Advantageously, the advanced PDC cutting structures described above enable an expandable reaming tool to efficiently underream formations below, for example, casing set in a wellbore. Moreover, the advanced PDC cutting structures may optimize reaming parameters (such as rate of penetration) and decrease the time required to underream a wellbore to a desired diameter.

While the invention has been described with respect to a limited number of embodiments, those skilled in the art, having benefit of this disclosure, will appreciate that other embodiments can be devised which do not depart from the scope of the invention as disclosed herein. Accordingly, the scope of the invention should be limited only by the attached claims.

What is claimed is:

1. An expandable reaming tool, comprising:

at least two reamer pads operatively coupled to a tool body and configured to be displaced between a retracted position and an expanded position;

at least one spiral blade formed on at least one of the at least two reamer pads;

a plurality of cutting elements disposed on the at least one spiral blade,

wherein the plurality of cuffing elements are arranged so as to substantially balance at least one parameter selected from axial force, lateral force, work, and mass between the at least two reamer pads,

wherein the expandable reaming tool is configured to ream while drilling.

2. The expandable reaming tool of claim **1**, wherein the plurality of cutting elements comprise at least one of polycrystalline diamond inserts, tungsten carbide inserts, and boron nitride inserts.

3. The expandable reaming tool of claim **1**, further comprising at least one gage protection element disposed on a gage surface of the at least one spiral blade.

4. The expandable reaming tool of claim **3**, wherein the at least one gage protection element comprises at least one of a thermally stabilized polycrystalline insert and a polycrystalline diamond insert.

5. The expandable reaming tool of claim **1**, further comprising a vibration damping insert disposed on the at least one spiral blade.

6. The expandable reaming tool of claim **1**, wherein the at least two reamer pads and the plurality of cuffing elements are arranged to backream a formation in a wellbore.

7. The expandable reaming tool of claim **1**, wherein the plurality of cutting elements are arranged to form a tapered cutting structure.

8. The expandable reaming tool of claim **1**, wherein the plurality of cutting elements have backrake angles of greater than 20 degrees.

9. The expandable reaming tool of claim **1**, wherein selected ones of the plurality of cutting elements have different backrake angles than other ones of the plurality of cutting elements.

10. The expandable reaming tool of claim **1**, wherein each of the plurality of cutting elements has a diameter of less than 13.0 mm or greater than 13.0 mm.

11. The expandable reaming tool of claim **1**, wherein selected ones of the plurality of cutting elements disposed on one of the at least two reamer pads are positioned so as to form

a redundant cutting arrangement with other selected ones of the plurality of cutting elements disposed on a different one of the at least two reamer pads.

12. The expandable reaming tool of claim 1, wherein the at least two reamer pads and the plurality of cutting elements are configured to substantially mass balance the expandable reaming tool about an axis of rotation of the reaming tool.

13. The expandable reaming tool of claim 1, wherein the at least two reamer pads and the at least one spiral blade are formed from a non-magnetic material.

14. The expandable reaming tool of claim 1, wherein the at least two reamer pads and the at least one spiral blade are formed from a matrix material infiltrated with a binder alloy.

15. The expandable reaming tool of claim 1, wherein surfaces of the at least one spiral blade proximate the plurality of cutting elements are shaped so that a cutting element exposure is equal to at least half of a diameter of the cutting element.

16. The expandable reaming tool of claim 1, wherein a perpendicular distance measured from a surface of the at least two reamer pads to an outermost extent of a gage cutting element disposed on the at least one spiral blade is equal to at least twice a diameter of the gage cutting element.

17. The expandable reaming tool of claim 1, wherein a gage surface of the at least one spiral blade comprises a hardfacing material.

18. The expandable reaming tool of claim 1, wherein a gage surface of the at least one spiral blade is formed from a diamond impregnated material.

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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO.	:	7,451,837
APPLICATION NO.	:	10/774,134
ISSUE DATE	:	November 18, 2008
INVENTOR(S)	:	Carl M. Hoffmaster et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims:

In Claim 6, column 10, line 50, "cuffing" should be --**cutting**--.

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JAN 22 2009

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Application No. (if known): 10/774,134 Attorney Docket No.: 05516/089003

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